

Table 1: Primary IXO Science Objectives

Science Question	Measurement	Key IXO performance requirements
What happens close to a black hole?	Time resolved high resolution spectroscopy of the relativistically-broadened features in the X-ray spectra of stellar mass and supermassive black holes	Spectral resolution of 2.5 eV at 6 keV; effective area $> 0.65 \text{ m}^2$ at 6 keV and 150 cm^2 at 30 keV.
When and how did super-massive black holes grow?	Measure the spin in supermassive black holes; distribution of spins determines whether black holes grow primarily via accretion or mergers.	Spectral resolution of 150 eV at 6 keV and 1 keV at 30 keV; effective area of 3 m^2 at 1.25 keV, 0.65 m^2 at 6 keV, and 150 cm^2 at 30 keV; 5 arcsec angular resolution and 18 arcmin field of view at 2 keV.
How does large scale structure evolve?	(i.) Find and characterize the missing baryons by performing high resolution absorption line spectroscopy of the WHIM over many lines of sight using AGN as illumination sources. (ii.) Measure the growth of cosmic structure and the evolution of the elements by measuring the mass and composition of clusters of galaxies at redshift < 2	(i.) Spectral resolving power of > 3000 ; effective area $> 1000 \text{ cm}^2$ in 0.3-1.0 keV band. (ii.) Imaging spectroscopy with spectral resolution of 10 eV at 6 keV; 10 arcsec angular resolution and 5 arcmin field of view across 0.3-7.0 keV band; effective area of 1 m^2 at 1.25 keV and 0.1 m^2 at 6 keV.
What is the connection between supermassive black hole formation and evolution of large scale structure (i.e., cosmic feedback)?	Measure the metallicity and velocity structure of hot gas in galaxies and clusters.	Imaging spectroscopy with spectral resolution of 2.5 eV at 6 keV; 5 arcsec angular resolution and 2 arcmin field of view across 0.3-7.0 keV band; effective area of 3 m^2 at 1.25 keV and 0.65 m^2 at 6 keV; total bandpass of 0.3-10 keV.
How does matter behave at very high density?	Measure the equation of state of neutron stars through (i.) spectroscopy and (ii.) timing	(i.) Spectral resolving power > 3000 ; effective area $> 1000 \text{ cm}^2$ in 0.3-1.0 keV band. (ii.) Maximum count rate of 10^6 s^{-1} with relative timing accuracy of 10 μs and < 10 percent deadtime over 0.3-10 keV band; spectral resolution of 150 eV and effective area of 0.6 m^2 at 6 keV.